WHAT IS CLAIMED IS:

1. An electrostatic fluid regulating device comprising a plurality of fluid regulating elements numbered from 1 through N disposed on a substrate; each of the fluid regulating elements comprising:

a fluid channel comprises an inlet at a first end and an outlet at a second end, the fluid channel being disposed overlying the substrate;

an actuation region disposed overlying the substrate and coupled to the fluid channel;

a polymer based diaphragm coupled between the fluid channel and the actuation region;

a first electrode coupled to the substrate and to the actuation region;

a second electrode coupled to the polymer based diaphragm;

an electrical power source coupled between the first electrode and the second electrode and substantially free from causing an electric field within the fluid channel region; and

wherein the first electrode and the second electrode are physically separated from each other by at least the actuation region, and are coupled when a potential difference arises between them.

2. The device of claim 1 wherein the fluid device is a pump.

3. The device of claim 1 wherein the fluid channel containing liquid.

4. The device of claim 1 wherein the fluid channel containing gas.

5. The device of claim 1 wherein the actuation region containing gas.

6. The device of claim 1 wherein the actuation region contains electronic liquid including fluorinate.

7. The device of claim 1 wherein each of the fluid channels of each of the respective fluid regulating elements is coupled with each other in a serial manner.

8. The device of claim 1 wherein each of the fluid channels of each of the respective fluid regulating elements is coupled with each other in parallel.

9. The device of claim 1 wherein the plurality of the fluid regulating elements are actuated in a peristaltic manner.

10. The device of claim 1 wherein each of the fluid channels is characterized by a height of less than 5 microns.

11. The device of claim 1 wherein the height of the fluid channels is equal or larger than 5 micron.

12. The device of claim 1 wherein each of the polymer based diaphragms is characterized by a diameter ranging from 10 to 1000 micron.

13. The device of claim 1 wherein the polymer based diaphragm is characterized by a diameter that is larger than 1000 microns.

14. The device of claim 1 wherein the polymer based diaphragm is characterized by a thickness ranging from 0.1 to 10 microns.

15. The device of claim 1 wherein the polymer based diaphragm is characterized by a thickness of greater than 10 microns.

16. The device of claim 1 wherein the second electrode is embedded within the polymer based diaphragm.

17. The device of claim 1 wherein the substrate is made of a material selected from silicon or glass.

18. The device of claim 1 wherein the electrode comprises a material selected from the group consisting of gold, aluminum, platinum, chrome, titanium, and doped polysilicon.

19. The device of claim 1 wherein the polymer based diaphragm comprises a material selected from the group consisting of Parylene, polyimide, and silicone.

20. The device of claim 1 wherein the actuation regions of the plurality of fluid-regulating elements are connected and sealed.

21. The device of claim 1 wherein the fluid device is a valve.

22. A method for fabricating a micro fluidic device, the method comprising:

providing a substrate;

patterning a first electrode layer to form a plurality of first electrode elements overlying the substrate;

forming a first polymer based layer overlying the plurality of first electrode elements;

forming a first sacrificial layer overlying the first polymer based layer;

forming a second polymer based layer overlying the first sacrificial layer;

patterning a second electrode layer to form a plurality of second electrode elements over the second polymer based layer, each of the second electrode elements being associated with respective first electrode elements;

forming a third polymer based layer overlying the plurality of second electrode elements to sandwich the plurality of second electrode elements between the second polymer based layer and the third polymer based layer;

forming a second sacrificial layer overlying the third polymer based layer;

forming a fourth polymer based layer overlying the second sacrificial layer;

releasing the first sacrificial layer between the first polymer based layer and the second polymer based layer; and

releasing the second sacrificial layer between the second polymer based layer and the third polymer based layer.

23. The method of claim 22 wherein:

the first, second, and third polymer based layers are formed at a temperature of less than 120°C; and

the first and second sacrificial layers are forming and released at a temperature of less than 120°C.

24. The method of claim 22 wherein the released first sacrificial layer forms a first channel opening.

25. The method of claim 22 wherein the first polymer based layer, the second polymer based layer, and third polymer based layer are provided at room temperature using chemical vapor deposition of Parylene.

26. The method of claim 22 wherein the first polymer based layer, the second polymer based layer, and third polymer based layer stable in water.

27. The method of claim 22 wherein the releasing of the first sacrificial layer is provided by dissolving the first sacrificial layer using a solvent.

28. A method of flowing a fluid comprising:

providing an electrostatic fluid regulating device comprising a plurality of fluid regulating elements numbered from 1 through N disposed on a substrate, each of the fluid regulating elements comprising,

a fluid channel comprises an inlet at a first end and an outlet at a second end, the fluid channel being disposed overlying the substrate,

an actuation region disposed overlying the substrate and coupled to the fluid channel,

a polymer based diaphragm coupled between the fluid channel and the actuation region, and

a first electrode coupled to the substrate and to the actuation region;

a second electrode coupled to the polymer based diaphragm such that the first electrode and the second electrode are physically separated from each other by at least the actuation region; and

applying electrical power from a source in a sequence to create a potential difference between the first and second electrodes of first, second, and third fluid regulating elements in turn, the first and second electrodes coupled when a potential difference arises between them such that contents of the fluid channel region are substantially free from an applied electric field.

29. The method of claim 28 wherein providing the electrostatic fluid regulating device comprises providing three fluid regulating elements.

30. The method of claim 29 wherein applying electrical power comprises applying electrical power to a first fluid regulating element, and then applying electrical power to a second fluid regulating element proximate to the first fluid regulating element, and then applying electrical power to a third fluid regulating element, the second fluid regulating element positioned between the first and third fluid regulating elements.

31. The method of claim 28 wherein applying electrical power results in a peristaltic pumping action of the fluid regulating elements.

32. The method of claim 28 wherein providing the second electrode comprises providing the second electrode sandwiched between layers of Parylene.

33. The method of claim 28 wherein applying electrical power to create a potential difference between the first and second electrodes causes the second electrode and diaphragm to be drawn toward the first electrode and the actuation region.